REMARKS

By way of this Amendment, claims 1, 11, 14, and 18 have been amended, claim 4 has been canceled, and the specification has also been amended. Accordingly, claims 1-3, and 5-22 remain present in this application. Applicants respectfully request reconsideration and allowance of the present application.

In the present Office Action, the Examiner stated that the Information Disclosure Statement filed January 31, 2002, failed to comply with 37 C.F.R. §1.98(a)(2) because a copy of two cited publications were not provided. Applicants are filing herewith a Supplemental Information Disclosure Statement listing these two references and have submitted a copy of each cited reference therewith.

Claims 4, 14, and 18 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants have canceled claim 4, and have removed "centrally located" from claim 14. Additionally, Applicants have amended claim 18 to remove the alleged vague and indefinite limitation. Accordingly, the rejection to claims 4, 14, and 18 under 35 U.S.C. §112, second paragraph, is now rendered moot.

Claims 1-3, 5-13, and 15-22 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yokota et al. (U.S. Patent No. 5,707,077) in view of Zerbini et al. (U.S. Patent No. 6,508,124). Applicants have amended independent claims 1 and 11, and submit that the claims, as amended, are patentable for the reasons set forth below.

The reference to Yokota et al. teaches a three-dimensional acceleration sensor having a massive part (5) connected to a central part (9) via beams (10). The massive part (5) is movable such that a gap between a stationary electrode (7) formed on a glass plate (2) and the massive part (5) changes with acceleration applied to the face of the massive part (5). Changes in capacitance can be monitored at four corners of the massive part (5) and processed to determine acceleration in any of the X, Y, and Z directions.

The reference to Zerbini et al. discloses a microelectromechanical structure having a rotor element supported and biased via a suspension structure. FIG. 13 of Zerbini et al. illustrates a linear accelerometer (70) having a pair of seismic masses (71) of a generally

rectangular shape extending parallel to and at a distance from each other. The seismic masses (71) are connected via four springs (72) to a central beam (73), which also has a rectangular shape and extends parallel to the seismic masses in a central position.

In contrast, Applicants' claim 1, as amended, recites a linear accelerometer having a substrate, and a fixed electrode supported on the substrate and including a first plurality of fixed capacitive plates. The linear accelerometer also includes an inertial mass substantially suspended over a cavity and including a plurality of movable capacitive plates arranged to provide a capacitive coupling with the first plurality of fixed capacitive plates. The inertial mass is linearly movable relative to the fixed electrode. The first plurality of movable cappacitive plates are radially extended from an outer perimeter of the inertial mass, and the first plurality of fixed capacitive plates are radially displaced from the inertial mass. The accelerometer also has a central member fixed to the substrate and located substantially in a central region of the inertial mass, and a plurality of support arms for supporting the inertial mass relative to the fixed electrode and allowing linear movement of the inertial mass upon experiencing a linear acceleration along a sensing axis, and for preventing movement along a non-sensing axis. The linear accelerometer further includes an input electrically coupled to one of either the first electrode and the inertial mass for receiving an input signal, and an output electrically coupled to the other of the fixed electrode and the inertial mass for providing an output signal which varies as a function of the capacitive coupling and is indicative of linear acceleration along the sensing axis.

Applicants submit that the references to Yokota et al. and Zerbini et al., either singly or in combination, do not teach or suggest a linear accelerometer as recited in claim 1, as amended. This is because neither of these references teach or suggest a linear accelerometer having an inertial mass suspended over a cavity and including movable capacitive plates radially extending from an outer perimeter of the inertial mass with fixed capacitive plates radially displaced from the inertial mass. Instead, the Yokota et al. accelerometer employs a capacitive coupling to a plate formed below the movable mass and, hence, has no such radially extending movable capacitive plates extending from an outer perimeter of the inertial mass and arranged with fixed capacitive plates radially displaced from the inertial mass. The Zerbini et

al. linear accelerometer shown in FIG. 13 is a rectangular configured accelerometer employing multiple masses, and does not teach or suggest the inertial mass having movable capacitive plates arranged with fixed capacitive plates as set forth in claim 1, as amended.

Applicants' claim 11, as amended, recites a linear accelerometer comprising a substrate, a first bank of variable capacitors formed on a first plurality of fixed capacitive plates and a first plurality of movable capacitive plates, and a second bank of variable capacitors formed on a second plurality of fixed capacitive plates and a second plurality of movable capacitive plates. The linear accelerometer also includes an inertial mass that is linearly movable in response to linear accelerometer along a sensing axis. The inertial mass is electrically coupled to the first and second plurality of movable capacitive plates and is arranged so that the first and second movable capacitive plates form capacitive couplings with the first and second plurality of fixed capacitive plates. The first movable capacitive plate and first fixed capacitive plate forms a positive-to-negative orientation coupling with respect to the sensing axis, while the second movable capacitive plate and second fixed capacitive plate form a capacitive coupling having an opposite positive-to-negative orientation with respect to the sensing axis. The opposite positive-to-negative orientations of capacitive coupling formed with the first and second banks of variable capacitors essentially nulls out rotational cross-axis sensitivities and linear off-axis sensitivities, and allows for linear acceleration to be sensed along the sensing axis.

P-N orientations

It is submitted that neither of the Yokota et al. and Zerbini et al. references, either singly or in combination, teaches or suggests a linear accelerometer having first and second banks of variable capacitors arranged in opposite positive-to-negative orientations of capacitive couplings, as set forth in claim ~~1~~ 11. Accordingly, it is submitted that claim 11, as amended, likewise would not have been rendered obvious to one of ordinary skill in the art at the time of the present invention in view of the combination of Yokota et al. and Zerbini et al.

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Applicants' claim 20 recites a micromachined linear accelerometer having a substrate, a fixed electrode supported on the substrate and including a first plurality of fixed capacitive plates, and a ring having a central opening and including a plurality of movable capacitive plates at the outer perimeter arranged to provide a capacitive coupling with the first plurality

of fixed capacitive plates. The ring is suspended over a cavity and is linearly movable relative to the fixed electrode. The linear accelerometer also includes a central member fixed to the substrate and located within the central opening of the ring, and a plurality of support arms extending between the central member and the ring for supporting the ring relative to the fixed electrode and allowing linear movement of the ring along a sensing axis upon experiencing a linear acceleration along the sensing axis. The linear accelerometer further includes an input electrically coupled to one of either the fixed electrode and the ring for receiving an input signal, and an output electrically coupled to the other of the fixed electrode and the ring for providing an output signal which varies as a function of the capacitive coupling and is indicative of linear acceleration along the sensing axis.

Neither of the references to Yokota et al. and Zerbini et al. teaches or suggests a linear accelerometer employing a ring having a central opening and including a plurality of movable capacitive plates at the outer perimeter arranged to provide a capacitive coupling with the first plurality of fixed capacitive plates, with the ring suspended over a cavity and linearly movable relative to the fixed electrode. Instead, Yokota et al. teaches No! 3-D an angular accelerometer, while Zerbini et al. teaches the use of rectangular masses in an No! claim 13 angular accelerometer. While Zerbini et al. also discloses a linear accelerometer, the linear accelerometer clearly employs rectangular masses, in contrast to a ring. Accordingly, it is submitted that claim 20, would not have been rendered obvious to one of ordinary skill in the art at the time of the present invention.

Claims 2-4, 14, and 20-22 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yokota et al. in view of Zerbini et al. as applied to claims 1-3, 5-13, and 15-22, above, and further in view of Rich (U.S. Patent No. 6,257,062). Applicants are of the position that these claims are allowable for the reasons discussed above with respect to the independent claims, from which the claims recited in this rejection depend. Additionally, Applicants submit that the reference to Rich discloses an angular accelerometer for sensing angular acceleration. The reference to Rich, either singly or in combination with Yokota et al. and Zerbini et al., does not teach or suggest Applicants' claimed invention as set forth in the independent claims.

The remaining prior art made of record in the present Office Action was not applied to the claims, and thus is not discussed herein. Applicants have reviewed these references and agree with the Examiner that such references do not teach or suggest the claimed invention.

By way of the foregoing discussion, Applicants have demonstrated that claims 1-3 and 5-22, as amended, are not rendered obvious in view of the cited combinations of Yokota et al., Zerbini et al., and Rich. Accordingly, it is submitted that claims 1-3 and 5-22, as amended, are allowable, which action is respectfully requested.

In view of the above remarks, it submitted that claims 1-3 and 5-22, as amended, define patentable subject matter and are in condition for allowance, which action is respectfully solicited. If the Examiner has any questions regarding patentability of these claims, the Examiner is encouraged to contact Applicants' undersigned attorney to discuss the same.

Respectfully submitted,

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August 18, 2003.
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